AMENDMENTS TO THE CLAIMS:

This listing of claims will replace all prior versions and listings of claims in this application.

1. (Currently Amended) An integrated microfluidic device comprising a sample chamber and a fluid reservoir connected by a microfluidic channel, wherein

the microfluidic channel comprises an inlet and an outlet,

the sample chamber ~~has a depth greater than that of the microfluidic channel~~, is positioned at the inlet of the microfluidic channel, and comprises

a first electrode and a second electrode capable of generating a first electric field in the sample chamber, wherein the sample chamber containing the first and second electrodes is a single compartment, ~~and optionally comprises two or more compartments, connected by one or more channels that allow a fluid medium to flow freely between the compartments,~~ wherein the first electric field is configured to transfer charged molecules in the sample chamber to the inlet of the microfluidic channel, and

the fluid reservoir is positioned at the outlet of the microfluidic channel, and comprises a third electrode capable of generating a second electric field with at least the second electrode.

2. (Original) The integrated microfluidic device of claim 1, wherein the charged molecules are nucleic acid molecules.

3. (Original) The integrated microfluidic device of claim 2, wherein the nucleic acid molecules are deoxyribonucleic acids.

4. (Original) The integrated microfluidic device of claim 1, wherein the charged molecules are proteins.

5. (Currently Amended) An integrated microfluidic device comprising a sample chamber and a fluid reservoir connected by a microfluidic channel, wherein

the microfluidic channel comprises an inlet and an outlet,

the sample chamber ~~has a depth greater than that of the microfluidic channel,~~ is positioned at the inlet of the microfluidic channel, and comprises

a first electrode and a second electrode, capable of generating a first electric field in the sample chamber, and a section of matrix material comprising charged molecules, wherein the sample chamber containing the first and second electrodes is a single compartment ~~and optionally comprises two or more compartments, connected by one or more channels that allow a fluid medium to flow freely between the compartments~~;

wherein the first electric field is configured to electro-elute the charged molecules from the section of matrix material and to transfer the charged molecules to the inlet of the microfluidic channel, and

the fluid reservoir is positioned at the outlet of the microfluidic channel and comprises a third electrode capable of generating a second electric field with at least the second electrode.

6. (Original) The integrated microfluidic device of claim 5, wherein the charged molecules are nucleic acid molecules.

7. (Original) The integrated microfluidic device of claim 6, wherein the nucleic acid molecules are deoxyribonucleic acids.

8. (Original) The integrated microfluidic device of claim 7, wherein the deoxyribonucleic acids have a size greater than about 50 kilobases.

9. (Original) The integrated microfluidic device of claim 5, wherein the charged molecules are proteins.

10. (Original) The integrated microfluidic device of claim 5, wherein the charged molecules are polypeptide-sodium dodecyl sulfate supra-molecules.

11. (Original) The integrated microfluidic device of claim 5, wherein the section of matrix material is a gel plug.

12. (Original) The integrated microfluidic device of claim 11, wherein the gel plug is an agarose gel plug.

13. (Original) The integrated microfluidic device of claim 5, wherein the sample chamber comprises three electrodes.

14. (Original) The integrated microfluidic device of claim 5, wherein the two electrodes generate repeatedly inverted electric pulses.

15. (Currently Amended) An integrated microfluidic device comprising a sample chamber and a fluid reservoir connected by a microfluidic channel, wherein

the microfluidic channel comprises an inlet and an outlet,

the sample chamber ~~has a depth greater than that of the microfluidic channel,~~ is positioned at the outlet of the microfluidic channel, and comprises

a first electrode and a second electrode capable of generating a first electric field in the sample chamber, ~~and optionally comprises two or more compartments, connected by one or more channels that allow a fluid medium to flow freely between the compartments,~~ wherein the sample chamber containing the first and second electrodes is a single compartment, and wherein the first electric field is configured to transfer charged molecules from the outlet of the microfluidic channel into the sample chamber, and

the fluid reservoir is positioned at the inlet of the microfluidic channel and comprises a third electrode capable of generating a second electric field with at least the second electrode.

16. (Original) The integrated microfluidic device of claim 15, wherein the charged molecules are nucleic acid molecules.

17. (Original) The integrated microfluidic device of claim 16, wherein the nucleic acid molecules are deoxyribonucleic acids.

18. (Original) The microfluidic device of claim 17, wherein the deoxyribonucleic acids are greater than about 50 kilobases in size.

19. (Original) The integrated microfluidic device of claim 15, wherein the charged molecules are proteins.

20. (Currently Amended) An integrated microfluidic device comprising a sample chamber and a fluid reservoir connected by a microfluidic channel, wherein

the microfluidic channel comprises an inlet and an outlet,

the sample chamber ~~has a depth greater than that of the microfluidic channel,~~ is positioned at the outlet of the microfluidic channel, and comprises

a first electrode and a second electrode, capable of generating a first electric field in the sample chamber, and a section of matrix material, wherein the sample chamber containing the first and second electrodes is a single compartment ~~and optionally comprises two or more compartments, connected by one or more channels that allow a fluid medium to flow freely between the compartments~~; wherein the first electric field is configured to transfer charged molecules from the outlet of the microfluidic channel into the section of matrix material, and

the fluid reservoir is positioned at the inlet of the microfluidic channel and comprises a third electrode capable of generating a second electric field with at least the second electrode.

21. (Original) The integrated microfluidic device of claim 20, wherein the charged molecules are nucleic acid molecules.

22. (Original) The integrated microfluidic device of claim 21, wherein the nucleic acid molecules are deoxyribonucleic acids.

23. (Original) The integrated microfluidic device of claim 22, wherein the deoxyribonucleic acids have a size greater than about 50 kilobases.

24. (Original) The integrated microfluidic device of claim 20, wherein the charged molecules are proteins.

25. (Original) The integrated microfluidic device of claim 20, wherein the section of matrix material is a gel plug.

26. (Original) The integrated microfluidic device of claim 25, wherein the gel plug is an agarose gel plug.

27. (Withdrawn) A method for loading charged molecules contained in a section of matrix material onto a microfluidic device comprising a loading chamber and a microfluidic channel, the method comprising:

introducing the section of matrix material containing the charged molecules into the loading chamber, wherein the loading chamber comprises two electrodes;

applying an electric field across the loading chamber;

electro-eluding the charged molecules from the section of matrix material; and

delivering the charged molecules to the microfluidic channel.

28. (Withdrawn) The method of claim 27, wherein the charged molecules are nucleic acid molecules.

29. (Withdrawn) The method of claim 28, wherein the nucleic acids are deoxyribonucleic acids.

30. (Withdrawn) The method of claim 29, wherein the deoxyribonucleic acids are greater than about 50 kilobases in size.

31. (Withdrawn) The method of claim 27, wherein the charged molecules are proteins.

32. (Withdrawn) The method of claim 27, wherein the section of matrix material is a gel plug.

33. (Withdrawn) The method of claim 32, wherein the gel plug is an agarose gel plug.

34. (Withdrawn) The method of claim 27, wherein the sample chamber comprises three electrodes.

35. (Withdrawn) The method of claim 27, wherein the two electrodes generate repeatedly inverted electric pulses.

36. (Withdrawn) A method for loading charged molecules onto a section of matrix material contained in an integrated microfluidic device comprising:

an unloading chamber comprising two electrodes and the section of matrix material, and

a micro-fluidic channel comprising an inlet and an outlet

the method comprising:

applying an electric field across the unloading chamber;

transferring the charged molecules from the outlet of microfluidic channel into the unloading chamber; and

delivering the charged molecules onto the section of matrix material.

37. (Withdrawn) The method of claim 36, wherein the charged molecules are nucleic acid molecules.

38. (Withdrawn) The method of claim 37, wherein the nucleic acids are deoxyribonucleic acids.

39. (Withdrawn) The method of claim 38, wherein the deoxyribonucleic acids are greater than about 50 kilobases in size.

40. (Withdrawn) The method of claim 36, wherein the charged molecules are proteins.

41. (Withdrawn) The method of claim 36, wherein the section of matrix material is a gel plug.

42. (Withdrawn) The method of claim 41, wherein the gel plug is an agarose gel plug.